

MOWER WITH FLIP UP MOWING DECK

Background of the Invention

1 The present invention relates to a riding lawn mower
2 and more particularly to a midmount riding lawn mower having
3 a mower deck that is swingable from a mowing configuration
4 to an access configuration having a height adjustment
5 mechanism that easily captures the mower deck for mowing and
6 releases the deck for access and a pair of arms which form a
7 parallelogram when the deck is in the mowing configuration
8 and extend outwardly in the access configuration.

9 Prior mowers have included a mower deck that is mounted
10 such that the deck can tilt or rotate to a position
11 conducive for maintenance of the deck's under housing (e.g.
12 cleaning, replacing blades, etc). Typically, decks of this
13 type have been described as "tiltable" or "tilting" such as
14 in the United States Patents Sameshima No. 5,079,907 and
15 Shroeder No. 4,779,406 respectively. Prior art structures
16 have been complicated, hard to operate, expensive to
17 manufacture and/or present other problems both in use in
18 mowing and in trying to convert between a mowing
19 configuration and an access configuration.

20 The present invention is especially useful in

1 conjunction with a midmount mower wherein the mower deck is
2 mounted between the front and rear wheels of the device. In
3 such a device, it is desirable to make conversion between
4 the mowing configuration and the access configuration easy
5 and quick. Nevertheless, it is also necessary to provide a
6 support structure for the deck that maintains the deck level
7 during mowing and allows for easy cutting height adjustment.
8 It is also desirable to provide such a device that utilizes
9 a single drive belt that can be easily removed to allow for
10 conversion. Also, a simple to use level adjustment
11 mechanism is desirable to allow for fine adjustment of deck
12 level that is required to correct for damage, tolerance
13 variation or to modify the deck to be slightly non parallel
14 to the ground in accordance with the desires of the
15 operator.

16

17 Summary of the Invention

18 The present invention is directed to a midmount riding
19 mower having improved mechanism for allowing a mowing deck
20 thereof to be easily moved between a mowing configuration
21 and an access configuration wherein an underside of the
22 mower deck is exposed for repair or maintenance.

23 The mower includes a support structure for maintaining

1 the mower deck so the blades cut in planes that are
2 generally horizontal relative to the ground. The support
3 structure includes a pair of laterally spaced front legs and
4 a pair of laterally spaced rear legs. The front and rear
5 legs are pivotally connected to a frame of the mower at the
6 same location. The rear legs are medially hinged having an
7 upper portion that abuts the frame along the length thereof
8 during mowing such that the front and rear legs along with a
9 portion of the mower deck between pivotal attachments of the
10 front and rear legs with the mower deck generally form an
11 adjustable support parallelogram to maintain the cutting
12 blades so as to cut generally horizontal to the ground
13 surface.

14 Associated with and part of the support structure is
15 the height adjustment mechanism. The height adjustment
16 mechanism includes a pivot bar with a radially extending
17 operating handle and a pair of spaced radially extending
18 arms jointed by an engagement bar at the distal ends
19 thereof. The deck includes hook members that are sized and
20 positioned to engage the engagement bar when the deck is
21 positioned in a non raised position as the pivot bar is
22 rotated by the handle so as to first be captured and then
23 raised. As the deck raises, the parallelogram formed by the

1 support arms keeps the deck level. A pin is used with a
2 blocking arm to keep the deck from inadvertently becoming
3 disengaged from the engagement bar.

4 When in the non raised and non engaged position, the
5 deck can be pulled forward on the support arms and thus the
6 front can be raised to an access configuration by extending
7 the rear support arms to an almost linear configuration.
8 The process is reversed to return to a non raised
9 configuration, rejoined with the height adjustment mechanism
10 after which the deck is in the mowing configuration.

11 Unlike mowers that normally have a main drive belt and
12 a secondary drive belt that actually turns cutting blades,
13 the drive belt of the mower of this application is a unitary
14 single belt that is reeved to engage the motor as well as
15 pulleys driving each of the cutting blades. A tension
16 release mechanism is provided to release tension from the
17 belt to allow the belt to be removed from a motor pulley and
18 thereby allow the mower deck to be raised to the access
19 configuration thereof.

20 A fine tuning level adjustment is also provided with
21 each of the support front legs which allows fine adjustment
22 of the alignment of the mower deck to adjust level that may
23 be required because of variations due to construction

1 variations, damage, or because an operator wants to have the
2 front slightly higher than the rear to better attack grass
3 being cut. The level adjustment includes a clevis that is
4 pivotally joined to each the front leg and which is
5 adjustable from front to rear relative to the mowing deck.

6

7 Objects and Advantages of the Invention

8 Therefore, the objects of the present invention are: to
9 provide a midmount mower having a support structure that
10 maintains the deck generally horizontal to the ground during
11 mowing, but allows the deck to be swung easily to an access
12 configuration for repair or maintenance; to provide such a
13 mower deck having a parallelogram leg configuration to allow
14 the deck to maintain a generally horizontal position at any
15 cutting height during mowing and wherein a rear leg can be
16 extended to allow the deck to easily swing from the mowing
17 configuration to the access configuration; to provide such a
18 mower deck wherein converting from the mowing configuration
19 to the access configuration requires minimal manipulation of
20 controls or apparatus; to provide such a mower with a
21 support structure that extends to an over center
22 configuration, so that when the deck is raised to the access
23 configuration, the configuration is stable; to provide such

1 a mower having a height adjustment mechanism that operates
2 in conjunction with the support structure to allow the mower
3 deck to be easily converted from the access configuration to
4 the mowing configuration, allows for height of cutting
5 adjustment and helps support the rear of the mower deck all
6 under the control of a single adjustment lever by the
7 operator; to provide a plurality of cutter blade pulleys and
8 guide pulleys that are connected by a single belt to a motor
9 pulley, so that a single tension pulley can release tension
10 from the entire system to allow disengagement of the belt;
11 to provide a fine height-adjustment mechanism to allow the
12 front of the deck to be adjusted in both height and angle to
13 accommodate the particular deck and desires of the user; to
14 provide such a mower having a height adjustment mechanism
15 with a rod that can be captured by deck hook by simple
16 movement of the height adjustment lever; to provide such a
17 mower having a mower deck that can be positioned forward of
18 the remainder of the mower for ease of access and
19 simplicity; to provide such a mower that is easy to use,
20 relatively inexpensive to make because of simpler mechanisms
21 and especially well adapted for the intended usage thereof.

22 Other objects and advantages of this invention will
23 become apparent from the following description taken in

1 conjunction with the accompanying drawings wherein are set
2 forth, by way of illustration and example, certain
3 embodiments of this invention.

4 The drawings constitute a part of this specification
5 and include exemplary embodiments of the present invention
6 and illustrate various objects and features thereof.

7

8 Brief Description of the Drawings

9 Fig. 1 is a perspective view of a lower heavy mowing
10 deck and a suspension apparatus for the deck in accordance
11 with the present invention.

12 Fig. 2 is a side elevational view of the mower
13 illustrating the mowing deck in a mowing and raised
14 configuration.

15 Fig. 3 is an enlarged and fragmentary side elevational
16 view of the mower with mower deck in a mowing configuration.

17 Fig. 4 is a side elevational view of the mower with the
18 mower deck in a mowing and lowered configuration and just
19 prior to rear disengagement of the mower deck from remainder
20 of the mower to allow flip up of the mower deck.

21 Fig. 5 is an enlarged and fragmentary side elevational
22 view illustrating the mower deck in a lowered configuration
23 and showing the supporting mechanism for the mowing deck in

1 a captured configuration in solid lines and in a release
2 configuration in dash lines.

3 Fig. 6 is a side elevational view of the mower showing
4 the mowing deck at a mid position between conversion from
5 the mowing configuration to an access configuration.

6 Fig. 7 is a side elevational view of the mower showing
7 the mower deck in the access configuration thereof.

8 Fig. 8 is a greatly enlarged and fragmentary
9 perspective view of a top of the mower deck and the support
10 mechanism and adjustment devices for use in conjunction with
11 the mower deck.

12 Fig. 9 is a fragmentary and enlarged perspective view
13 of a portion of the mower deck and remaining mower with a
14 frontward support and adjustment mechanism thereof.

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16 Detailed Description of the Invention

17 As required, detailed embodiments of the present
18 invention are disclosed herein; however, it is to be
19 understood that the disclosed embodiments are merely
20 exemplary of the invention, which may be embodied in various
21 forms. Therefore, specific structural and functional
22 details disclosed herein are not to be interpreted as
23 limiting, but merely as a basis for the claims and as a

1 representative basis for teaching one skilled in the art to
2 variously employ the present invention in virtually any
3 appropriately detailed structure.

4 The reference numeral 1 generally represents a mower
5 incorporating improvements in accordance with the present
6 invention. The mower 1 includes a mobile frame 5, a mower
7 deck 6 and a support and adjustment structure or mechanism 7
8 for joining the mower deck 6 to the frame 5.

9 The frame 5 includes a pair of generally parallel,
10 laterally spaced and longitudinally extending tubes or
11 channels 12 and 13 that are sized shaped and positioned to
12 be generally parallel to the ground when the mower 1 is
13 operating as a mower and cutting grass and the like. The
14 channels 12 and 13 are spaced by transverse members, such as
15 front transverse member 15 and by plating such as floor
16 plating 16 and forward cowling 17, so as to form an overall
17 solid structure to support the mower deck 6, as described
18 below.

19 The mobile frame 5 also includes a pair of front castor
20 wheels 18 and a pair of rear drive wheels 21. The mower 1
21 of the present invention is a mid mount or underbelly type
22 mower wherein all or substantially almost all of both the
23 mower deck 6 and support and adjustment mechanism 7 is

1 located from front to rear between the front wheels 18 and
2 the rear wheels 21 wherein the mower 1 is being utilized to
3 cut grass, as is seen in the illustrations shown in Figs. 1
4 and 2.

5 Mounted on the rear of the frame 5 is a motor assembly
6 25 which operably provides power to the drive and operate
7 the mower 1 through well known hydraulic wheel drivers
8 driven by a belt and a power pulley (not shown) by the motor
9 assembly 25. The motor assembly 25 also has a lower powered
10 drive pulley 26 which operably powers cutting blades on the
11 mower deck 6, as will be discussed below. The mower 1 of
12 the illustrated embodiment happens to be a zero radius
13 turning mower in which each of the rear wheels 21 and 22 is
14 driven by an independent hydraulic motor (not shown) which
15 is in turn driven by the motor assembly 25. A joystick 27
16 is mounted on the frame 5 and is located so as to be
17 accessible by the operator to allow the operator to
18 selectively control drive to each of the rear wheels 21,
19 thus controlling the direction and speed of the mower 1.
20 Mowers of the same general type are well known in the
21 industry. While the mower 1 of the present invention
22 happens to be a zero radius turning type mower and has
23 hydraulic units associated with the wheels, it is foreseen

1 that other types of mowers could readily be used in
2 conjunction with the present invention.

3 The mobile frame 5 also includes an operator seat 29
4 which allows an operator to be seated during operation of
5 the mower 1 and to control the mower 1 via the joystick 27.

6 The mower deck 6 has a top wall 34 and a peripheral
7 side wall 35 that depends from the top wall 34 except in the
8 area of a chute (not shown) for allowing discharge grass
9 therefrom. A middle front roller 38 and a pair of side
10 front rollers 39 are mounted on the front or to the left of
11 the mower deck 6. A pair of rear side rollers 41 are
12 mounted on the rear of the mower deck 6. The rollers 38, 39
13 and 41 keep the deck 6 somewhat spaced from a ground surface
14 that the deck 6 is traversing and helps prevent scalping of
15 the grass whenever the deck 6 gets too close to the ground
16 due to uneven terrain.

17 Three cutting blades 44 are mounted on the underside of
18 the mower deck 6 in a spaced relationship with one another
19 and so that their cutting patterns overlap from front to
20 rear in a manner that is well known in the art. Each of the
21 cutting blades 44 is rotatably mounted on a shaft 45 which
22 is in turn mounted on the deck top wall 34 and driven by a
23 blade pulley 47. As shown in Fig. 8, also rotatably mounted

1 on top of the deck top wall 34 are three guide pulleys 49,
2 50 and 51. A tension control pulley 54 is also mounted on
3 the deck top wall 34 and is moveable along a path to
4 selectively reduce or increase belt tension, as described
5 below. As seen in Fig. 10, tension control pulley 54 is
6 attached to a V-shaped lever arm 55 which is centrally
7 pivoted about a pivot 56 located beneath the center of the
8 pulley 51. The lever arm 55 is in turn attached to a spring
9 57 that is in turn connected to a second V-shaped lever arm
10 58 which is in turn connected to an L-shaped lever arm 59
11 extending to an operator handle 60 and a fixed pivot 61
12 opposite the operator handle 60 so as to allow an operator
13 to swing the lever arm 59 about the pivot 61 thereby also
14 swinging the lever arm 58 about a pivot 62 whereat it is
15 joined with the lever arm 59 so as to selectively position
16 the tension control pulley 54. Tension applying and tension
17 releasing positions for the pulley 54 and associated
18 mechanism are shown in Fig. 10 in solid and phantom lines
19 respectively.

20 A drive belt 65 is reeved or looped about each of the
21 pulleys 47, 49, 50, 51, 54 and the engine drive pulley 26 so
22 as to provide drive power between the engine and the blade
23 pulleys 47 so as to rotate the blades 44 when desired and

1 when the tensioning pulley 54 is providing tension to the
2 drive belt 65. The drive belt 65 traverses a path that is
3 generally planar except for slight variations due to raising
4 or lowering of the mower deck 6. In particular, the
5 tensioning pulley 54 provides tension to the belt 65 when
6 the operator handle 60 is in a first configuration thereof,
7 as is shown in solid lines in Fig. 10. The operator handle
8 60 can be selectively moved to a second configuration,
9 wherein the tensioning pulley 54 moves to the location shown
10 by phantom lines in Fig. 10 and which removes tension from
11 the drive belt 65 and allows the drive belt 65 to be easily
12 disconnected from the engine drive pulley 26 for
13 manipulation from the mower deck 6, as described below.

14 A pair of shields 67 are also mounted on the mower deck
15 top wall 34 in covering relationship to the outside blade
16 pulleys 47 so as to reduce the possibility of an operator
17 inadvertently getting caught between the drive belt 65 and
18 the pulleys 47.

19 The support adjustment structure 7 supports the mower
20 deck 6 relative on the mobile frame 5, allows selective
21 adjustment of the cutting height of the mower deck 6 during
22 operation and provides for selective positioning of the
23 mower deck 6 relative to the mobile frame 5 for purposes

1 other than cutting of grass. The support and adjustment
2 structure 7 includes a pair of front support arms 75 and a
3 pair of rear support arms 76 and a height adjustment and
4 release mechanism 79.

5 One of the pair of front support arms 75 is positioned
6 on each side of the frame 5 and pivotally attached to an
7 ear 82 within a respective channel 12 and 13. The lower
8 part of each front support arm 75 is pivotally attached by a
9 connector assembly 83 that is secured to the mower deck top
10 wall 34. One of the pair of rear support arms 76 is located
11 on opposite sides of the mobile frame 5 and are pivotally
12 attached at an upper end thereof to respective ears 82 and
13 at a lower end thereof to respective ears 86 mounted near
14 the rear end of the deck top wall 34. Each of the ears 86
15 has a rearwardly extending hook member 87 near the top
16 thereof.

17 Each of the rear support arms 76 has an upper section
18 or portion 89 and a lower section or portion 90 which are
19 joined at a pivot 91. The rear support arm lower portions
20 90 are essentially the same length as the front support arms
21 75 and the rear support arm upper portions 89 are
22 essentially the same length as the distance between the
23 locations whereat the front support arms 75 join connector

1 assemblies 83 and the rear support arms 76 join ears 86. In
2 this manner, a parallelogram-like structure is generally
3 formed in conjunction with the arms 75, 76 and that portion
4 of the deck top wall 34 that extends therebetween. However,
5 the dimensions of the parallelogram-like structure can be
6 varied somewhat as noted below. The rear support arm upper
7 portion 89 is joined to the frame 5 only at the ear 82;
8 however, each rear support arm upper portion 89 is designed
9 to abut against the under surface of respective channels 12
10 and 13, as is seen in Fig. 2 during operation of the mower 1
11 during the cutting of grass or the like. In this manner,
12 the mower deck 6 can swing about the front support arm 75
13 and rear support arm lower portion 90, while being
14 maintained in a generally parallel configuration with the
15 frame channels 12 and 13.

16 Furthermore, when the mower deck 6 is detached from the
17 height adjustment and release mechanism 79, as will be
18 discussed below, the frame 5 can be raised at the front
19 thereof and the mower deck 6 can be swung downwardly and
20 forwardly relative to the remainder of the frame 5, as is
21 seen in Fig. 6 until the front support arm 75 and the rear
22 support arm lower portions 90 become generally perpendicular
23 to the frame channels 12 and 13. Thereafter, the mower deck

1 6 can be swung still more forwardly near the rear thereof so
2 as to rotate the rear arm upper portions 89 away from the
3 channels 12 and 13, as is seen in Fig. 7 so as to expose the
4 underside of the mower deck 6 to an operator to allow the
5 operator to work on the mower cutting blades 44, to clean
6 the underside of the mower deck 6 or otherwise perform
7 maintenance on the structure.

8 In certain embodiments, it is foreseen that a pin, hook
9 or other structure could be equivalently provided on the
10 front support arm 75 or the rear support arm upper portion
11 89 to engage the opposite in such a way as to hold the upper
12 portion 89 in a parallel configuration relative to the top
13 of the deck 6 and in this way preform the same function as
14 the engagement of the upper portion 89 with the frame 5 that
15 is shown in the illustrated embodiment.

16 The mower deck 6 preferably has a slightly over-center
17 configuration when in the exposed configuration, as is also
18 seen in Fig. 7 wherein the rear support arms 76 are
19 stretched outwardly and substantially in line relative to
20 one another and the original rear, now bottom, of the mower
21 deck 6 is slightly forward of the original front, now top,
22 thereof, so as to form a stable exposed configuration to
23 allow an operator to work on the device without easy

1 collapse thereof.

2 With reference to Fig. 8, the height adjustment and
3 release mechanism 79 includes an elongate and laterally
4 extending pivot rod 95 laterally mounted on and extending
5 outwardly therefrom. Near opposite ends of the rod 95 are a
6 pair of rigidly joined lever arms 98. The lever arms 98
7 that each have an elongate slot 99 near the distal end
8 thereof through which a capture rod or bail 102 is mounted
9 so as to extend generally parallel to the rod 95. A spring
10 104 is sleeved on each of the lever arms 98 and extends
11 between the rod 95 and the rod 102 so as to urge the rod 102
12 outwardly relative within the slots 99. A second spring 107
13 is mounted between each of the distal ends of the lever arms
14 98 and the frame floor plating 16 so as to cushion movement
15 of the mechanism 79 at the capture rod 102.

16 Medially extending outwardly from the rod 95 between
17 the lever arms 98 is an operator handle or arm 110 that is
18 fixably attached to the rod 95 and rigidly extending
19 therefrom above the frame floor plating 16 and in the region
20 where the operator can access the handle 110 while in the
21 seat 29. A stop lever arm 113 also extends rigidly outward
22 from the rod 95 near the channel 12. The stop lever arm 113
23 is positioned so that swinging of the lever arm 113 by

1 rotation of the rod 95 moves the lever arm 113 into abutting
2 engagement with a stop pin 116 selectively located in
3 receiver 117. In this manner the rotation of the rod 95 is
4 limited when the pin 116 is in the receiver 117 and the rod
5 95 free to rotate further when the pin 116 is removed from
6 the receiver 117. It is foreseen that in some embodiments
7 the stop operably provided by the arm 113 engaging the pin
8 116 could be provided by other types of devices. For
9 example, a slide, rotatable plate or the like could be
10 operably placed under the handle 110 so as to engage the
11 handle upon downward movement and wherein such device could
12 be moved manually to allow an operator to further lower the
13 handle 110.

14 Each connector assembly 83, as is best seen in Fig. 9
15 comprises an outer U-shaped member 120 and an inner U-shaped
16 member 121. The outer member 120 is fixedly attached by
17 welding or the like to the mower deck top wall 34 and
18 includes a pair of longitudinally extending slots 124 in
19 each forward arm thereof. The inner U-shaped member 121 is
20 slideable relative to the outer member 120 and each forward
21 wall includes aligned bores 125 that also align with the
22 slots 124 and receive a pin 127. The bottom end of a
23 respective arm 75 is positioned to be surrounded by the

1 inner member 121 and has a bore 129 that also receives the
2 pin 127. A rear wall 130 of the inner member 121 also has
3 attached thereto a bolt 132 that extends rearwardly and
4 passes through a bore 134 in a rear wall 135 of the outer
5 member 120. A nut 137 allows adjustment of the position of
6 the bolt 132 to slide the inner member 121 relative to the
7 outer member 120 and thereby vary the angle of the front
8 arms 75. This allows height of the front sides of the mower
9 deck 6 to be adjusted slightly, if some irregularity exists
10 or to even raise the mower deck 6 front slightly relative to
11 the rear thereof for certain cutting operations. It is
12 foreseen that in some embodiments, a connector assembly 83
13 may be used to connect each of the rear support arms 76 to
14 the deck 6 or, where the top of the arms 75 and 76 are
15 independently joined to the frame 5, then a connector
16 assembly 83 could be utilized to connect either support arm
17 75 or 76 to the frame 5.

18 During use, the height adjustment and release mechanism
19 79 functions in the following way. When the pin 116 is
20 located in the receiver 117, the movement of the operator
21 handle 110 rotates the rod 95 and swings the capture rod 102
22 about through a similar angle of rotation as is incurred by
23 the operator handle 110 so as to move the mower deck 6

1 upwardly or downwardly as desired by the operator to adjust
2 the cutting height of the mower deck 6. Once the pin 116 is
3 removed from the receiver 117, the operator handle 110 can
4 rotate the rod 95 so that the capture rod 102 moves
5 rearwardly and downwardly and disengages from the hook
6 members 87. This frees the mowing deck 6 from the
7 adjustment and release mechanism 79. Further operation of
8 the operator handle 60 associated with the tensioning pulley
9 54 releases tension on the tensioning pulley 54 so that the
10 drive belt 65 can be released from the motor drive pulley 26
11 and thereby allow the mower deck 6 to be swung through the
12 position shown in Figures 6 and 7 to allow the mower deck to
13 move from a mowing configuration thereof as seen in Figure 2
14 to a maintenance configuration thereof, as seen in Figure 7.
15 The processes reverse to move the mower deck 6 back into the
16 mowing configuration thereof and the operator handle 60 is
17 rotated again so that the capture rod 102 comes into
18 engagement and is captured on the hook members 87 and
19 thereafter for the rotation of the operator handle 60 raises
20 the mowing deck 6 to a desired cutting level thereof.

21 It is to be understood that while certain forms of the
22 present invention have been illustrated and described
23 herein, it is not to be limited to the specific forms or
24 arrangement of parts described and shown.